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RESEARCH ARTICLE

Insurer Market Structure and Variation in Commercial Health Care Spending

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Objective. To examine the relationship between insurance market structure and health care prices, utilization, and spending.

Data Sources. Claims for 37.6 million privately insured employees and their dependents from the Truven Health Market Scan Database in 2009. Measures of insurer market structure derived from Health Leaders Inter study data.

Methods. Regression models are used to estimate the association between insurance market concentration and health care spending, utilization, and price, adjusting for differences in patient characteristics and other market-level traits.

Results. Insurance market concentration is inversely related to prices and spending, but positively related to utilization. Our results imply that, after adjusting for input price differences, a market with two equal size insurers is associated with 3.9 percent lower medical care spending per capita ($p = .002$) and 5.0 percent lower prices for health care services relative to one with three equal size insurers ($p < .001$).

Conclusion. Greater fragmentation in the insurance market might lead to higher prices and higher spending for care, suggesting some of the gains from insurer competition may be absorbed by higher prices for health care. Greater attention to prices and utilization in the provider market may need to accompany procompetitive insurance market strategies.

Key Words. Geographic variation, spending, utilization, competition, markets

Concern over high health care premiums among commercially insured Americans has created considerable interest in promoting competition in the insurance industry. For example, the Affordable Care Act calls on states to create insurance exchanges. Yet the impact of insurance competition on market outcomes is complex because of the interaction between insurers and health care providers (e.g., hospitals and physicians). While insurer competition may reduce the spread between insurer costs (largely the cost of medical care) and premiums, insurer competition may also increase the amount that insurers spend for care because it reduces insurer market power relative to providers.

Specifically, prices in the commercial sector are the result of negotiations between insurers and providers. Concentration in the insurer market implies greater bargaining power for insurers and thus potentially lower prices paid to providers (Philipson et al. 2010).

Research on provider market power suggests cause for concern. Prices paid by commercial payers for care rise with physician concentration (Dunn and Shapiro 2012), and higher hospital market concentration is associated with higher prices for orthopedic and cardiovascular services (Robinson 2011). In addition, hospital consolidation results in substantial increases in hospital prices (Melnick, Shen, and Wu 2011; Gaynor and Town 2012).

The extent to which providers can exercise this market power may be related to insurer concentration (or conversely insurer competition). In fact, a growing body of evidence suggests that prices for hospital care fall in more concentrated (less competitive) insurance markets (Moriya, Vogt, and Gaynor 2010; Melnick, Shen, and Wu 2011). These results imply that more concentrated insurance markets can counteract the price-increasing effects of hospital concentration.

The reduction in prices does not necessarily imply a reduction in medical spending because utilization may be related to insurer competition (or related to the changes in health care prices that reflect insurer competition). In fact, Bates and Santerre note that in markets with both insurer and provider market power, the reduction in prices may move the market toward an outcome that approximates the competitive outcome because insurer market power may counteract (or overwhelm) provider market power. In markets without provider market power, the reduction in prices associated with insurer concentration may lead to a monopsony outcome (Bates and Santerre 2008). One way to distinguish among these effects is to examine utilization. If insurer market power is offsetting provider market power, one would expect utilization to rise as prices fall. For example, if one imposes a binding price ceiling in a monopoly market, price falls and quantity rises. If instead provider markets are competitive and insurer concentration creates more monopsony power, one would expect utilization to fall as prices fall. For example, a binding price ceiling imposed on an otherwise competitive market would cause utilization

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to fall as prices fall. Bates and Santerre (2008) report evidence that hospital volume rises with insurer concentration, consistent with the view that insurer concentration offsets provider market power as opposed to generating monopsony power.

Existing literature has focused predominately on the impact of insurer market structure on hospital prices, with less research examining the impact across all types of services (e.g., physician services) and spending. The impact on overall spending is important because it is most relevant for premiums. Recent evidence, based on a single merger, found that the insurer merger increased premiums by approximately 7 percentage points (Dafny, Duggan, and Ramanarayanan 2012). Because this includes insurer markups as well as spending effects, it does not address the underlying question about the impact of mergers on prices of care, utilization, and medical spending.

In this article, we extend the existing literature on geographic variation by examining the relationship between insurer concentration and spending across all types of services, and further examining the components of spending, measures of prices, and utilization. Given our research design, our work should not be interpreted as implying a causal relationship. For this reason, we do not advocate for less (or more) insurer competition. Our intent is to illustrate an important concern. Specifically, some of the gains from greater insurer market competition may be offset by reductions in provider market competition. This does not imply that we should have monopoly insurers, but it suggests that policies aimed to increase insurer competition may not achieve all possible savings if the gains in insurer market competition lead to less provider market competition. The policy solution may not be to impede insurer competition. It may just make the need to address the problem of high provider prices more imperative.

Moreover, some may argue that fee reductions associated with insurer consolidation reflect monopsony power. Understanding the relationship between price and quantity across areas can shed light on that discussion. Specifically, there are many models of competition/bargaining and we do not have a strong attachment to any particular one. The insight from many such models is simple: If the market power on any party rises, the price will generally shift in that party's favor. In our case that would imply greater insurer consolidation would lead to lower prices for care. The impact on quantity is more ambiguous, depending on the initial equilibrium. In general, if the starting price is above the competitive equilibrium, one could tell a story of price reduction leading to higher quantity as the market moves down the demand curve (assuming the demand curve is binding). For example, with a lower

price insurers may devote less effort to reducing utilization if those efforts are costly. Alternatively, if the starting price is at or below the competitive equilibrium, we would expect the drop in price to lead to lower quantity as the market scales back along the supply curve. As a general point, observation of prices falling and quantity rising is more consistent with moving toward a competitive outcome than a monopsony one. The welfare consequences of insurer consolidation are more complex. Drawing strong conclusions would require us to know the value of the increased utilization and adjust for the markup in the insurer market. Our societal goal is not simply perfect competition in the provider market. We must worry about premiums. And we would need to worry about the cost of mitigating imperfect competition in either provider or insurer markets.

METHODS

Data/Sample

The analysis is based on 2009 inpatient and outpatient claims from the Truven Health MarketScan Commercial Claims and Encounters Database (MarketScan), which includes data on 37.6 million commercially insured members under the age of 65. Spending includes the actual amount paid for services (as opposed to charges), including any patient-level cost sharing or payment reimbursed by a supplemental insurer. Approximately 4 percent of all claims in the MarketScan database are for services covered under capitation, and approximately 8 percent of enrollees have at least one capitated claim. We drop individuals with any capitated claims, since we cannot observe a price for these claims. In our analysis, we control for the percentage of enrollees in HMOs, which is correlated with the percentage of people with capitated claims, and which will thus capture not only the HMO effect on care (including any spillovers from HMOs to non-HMO populations) but also any selection effects. This focus on Fee-For-Service (FFS) beneficiaries is similar to the large literature on geographic variation in Medicare spending that also focuses on FFS beneficiaries.

Variables

Spending is measured by combining all hospital and physician claims, including plan expenditures, supplemental payer expenditures, and beneficiary out-of-pocket spending. Spending for individuals with partial year enrollment is

annualized. In addition, we adjust spending for variation in input price following the method Medicare uses to determine the cost of providing care in a region. Specifically, inpatient facility claims are adjusted by dividing the Hospital Wage Index while outpatient and physician claims are adjusted by the Geographic Practice Cost Indices (Melnick and Keeler 2007).

We create an aggregate measure of utilization by repricing all services using national mean prices. Specifically, our basic unit of utilization is a "claim day," defined as all input price adjusted spending for an individual for a particular service code, on a given day. We rely on the "claim day" because services often generate multiple claims and because we do not observe modifier codes (e.g., assistant surgeon). To create an index of utilization across all services, we compute a standard national price for each service code, claim day using the national mean price for all claim days with that code. We then reprice all claim days using this standard price. This yields a measure of spending devoid of price variation across areas and is therefore treated as a measure of utilization. This method of aggregation allows for variation in the types of services consumed across markets that would be lost if using a fixed basket approach. As a sensitivity analysis, we also look at a set of specific physician and hospital codes that account for highest percent of total spending, including office visits of moderate complexity (CPT 99213), spinal fusion except cervical (DRG 460), major joint replacement (DRG 470), vaginal delivery (DRG 775), emergency department visits of moderate complexity (CPT 99283), surgical pathology (CPT 88305), and brain MRI (CPT 70553). These seven codes account for 6.4 percent of all medical spending in MarketScan (over $8.7 billion dollars in 2009).

Individual-level covariates include age (measured in 5-year age bands), gender, interactions between age and gender, fraction of the year enrolled, and health status. The health status measure is based on the DxCG system, which is similar to the HCC model used by CMS for the Medicare program. It is likely sensitive to area-specific utilization patterns and coding practices (because more intense use and coding increases the likelihood that diseases will be identified). In sensitivity analysis, we estimate models excluding health status. As a further sensitivity analysis, we estimate models that include measures of benefit generosity, based on the average out-of-pocket cost-sharing for five common services: brand name medications, generic medications, ED visit, inpatient admission, office visit. These out-of-pocket measures are averaged within each health plan-employer combination to reflect the benefit structure faced by the patient. When plans within an employer were small (less than 100 enrollees), plans were combined to create more stable estimates.

Our research question, about insurer competition, requires defining markets and creating market-level covariates. We define markets as the hospital referral region (HRR) (Dartmouth Medical School Center for the Evaluative Clinical Sciences 1998). To measure insurer concentration, we use HealthLeaders Interstudy data provided by the Commonwealth Fund to construct HRR-level insurer Herfindahl–Hirschman Index (HHI) computed using enrollment shares for each commercial plan (including commercial HMOs, PPOs, and traditional indemnity plans) on a scale from 0 to 1 where 1 represents perfect monopoly, and perfect competition results in a score approaching zero. Interstudy data are available only at the county level, and so we employed a zip code to county crosswalk to match counties to HRRs (Yuan et al. 2000).

Market-level control variables, based on the HealthLeaders data, include measures of percent of people covered by commercial HMOs, the percent enrolled in Medicare or Medicaid, and the percent uninsured. We control for these insurance market characteristics because it is likely that they are correlated with insurer concentration and also have a significant independent effect on prices or utilization. For instance, markets with substantial HMO penetration may depress utilization directly through management or may impact prices through negotiation practices. We also include several variables to control for provider side market structure. They include the number of physicians per 1,000 residents, based on the Area Resource File, a hospital HHI, computed based on the share of hospital admissions and adjusted for common hospital ownership within a hospital system using American Hospital Association Annual Survey Database, and the number of hospital beds per 1,000 residents, also based on AHA data.

Statistical Methods

We adopt a two-stage approach to estimate the relationship between insurer concentration and spending, utilization and prices. In our first stage, we create market-level estimates of (1) spending (adjusted for input prices) and (2) our index of quantity (for the aggregate measure) or count of procedures (for the individual services measure). To account for additional imprecision associated with partial-year enrollees, we also weight the regression models according to the fraction of the year enrolled. We then take the average of the individual-level residuals for each HRR as an estimate of market-level spending and utilization adjusted for individual traits. This approach is similar to an approach that uses HRR-level fixed effects in the models and uses the estimates of the

fixed effects as measures of adjusted spending, but our method is much less computationally burdensome (the correlation between our area-level estimates and analogous fixed effect estimates is over .98). Finally, to account for measurement error in smaller markets, we compute Empirical Bayes shrinkage estimates that weight HRR-level estimates with overall mean according to the ratio of within and between market variation (Dimick, Staiger, and Birkmeyer 2010).

Using the area-level estimates of spending and utilization, we compute a measure of adjusted market level price by dividing market-level spending (adjusted for input prices) by market-level utilization. Because our measure of spending is adjusted for variation in input prices, this measure of price is also adjusted for input prices.

In our second-stage regression, we regress market-level spending, utilization, and price on market traits, competition, and the market-level control variables mentioned above. To account for additional imprecision associated with smaller markets, we also weight the regression models according to the sample size in each market.

RESULTS

Variation in Spending and its Components

Consistent with the literature on geographic variation, we find a wide variation in adjusted spending across areas, with a coefficient of variation of .127 (Table 1). In comparison, the coefficient of variation in age, gender, and race adjusted Medicare data using data from the Dartmouth Atlas is .143. Decomposing spending into utilization and prices, we find the coefficient of variation in price is almost twice that of utilization (Table 1). In addition, we find a

Table 1: Market-Level Summary Statistics Adjusted for Age, Gender, Age-Gender Interactions, Partial-Year Enrollment, and DxCG Health Status

	Mean	*SD*	*Min*	*Max*	*Ratio of 75th–25th Percentile*	*Coefficient of Variation*
Utilization	3,509.36	321.60	2,479.39	4,438.31	1.110	.092
Price	0.996	0.148	0.676	1.518	1.202	.149
Spending	3,470.15	440.80	2,409.84	5,488.08	1.161	.127

Displays summary statistics across the 306 HRRs. Utilization is calculated as an aggregate index value. Both price and spending are adjusted for input prices.

Table 2: Decomposition of Variation in Spending

	Price	*Quantity*
Bottom quintile HRRs in terms of spending	0.83	3,513
Top quintile HRRs in terms of spending	1.19	3,470

Price and quantity are estimated for the top and bottom quintile HRRs in terms of spending. Both price and spending are adjusted for input prices. This demonstrates that price is far more variable than quantity.

strong inverse relationship between market-level prices and utilization (correlation = −.61).

Almost all of the variation in input price adjusted spending is driven by variation in price (Table 2). The HRRs in the top quintile of spending had an average price that was 19 percent above the mean compared with the lowest quintile, which had spending 17 percent below the average. On the other hand, average utilization in the highest spending quintile was actually lower than in the lowest spending quintile.

Relationship of Spending with Provider and Insurance Market Traits

Markets with a higher insurer concentration (less competition) have lower input price-adjusted prices and lower input price-adjusted spending, despite somewhat greater utilization (Table 3). For instance, our results imply a market with two equal size insurers is associated with about a 3.9 percent lower per capita input price-adjusted spending relative to one with three equal size insurers ($p = .002$), 5.0 percent lower prices ($p < .001$), and 1.6 percent higher utilization ($p = .036$). The estimate on price is similar to that found by Melnick, Shen, and Wu (2011) and Moriya, Vogt, and Gaynor (2010), who evaluate the impact of insurer concentration on hospital prices. This implies that the consolidation associated with insurer competition is associated with lower overall spending. We observed similar relationships when examining the top individual services (Table 4). Four of the top seven individual services show a positive and statistically significant relationship between insurance competition and price (office visits, emergency department visits, major joint replacements, and noncervical spine fusion), two show a positive but nonsignificant relationship (brain MRI and surgical pathology), and one shows a negative but nonsignificant relationship (vaginal delivery).

The relationships between input adjusted spending, utilization and prices and hospital competition measures, such as hospital HHI and beds per

Table 3: Relationship between Insurance Competition and Spending, Utilization, and Price

	Spending (Input Price Adjusted)	*Utilization*	*Price (Adjusted for Input Price Differences)*
Insurance Herfindahl Index	−803.78	337.20	−.30
	0.002	0.036	<0.005
% of pop. in commercial HMOs	−1,051.98	−2,124.09	0.37
	<0.005	<0.005	<0.005
% of pop. in Medicare	−2,019.98	1,925.08	−1.02
	0.045	0.003	0.002
% of pop. in Medicaid	−1,099.65	−1,196.11	0.05
	0.014	<0.005	0.734
% of pop. uninsured	−1,257.93	−505.43	−0.20
	0.033	0.172	0.296
Hospital Herfindahl Index	−115.02	−22.37	−0.02
	0.554	0.854	0.799
Beds per 100,000	2,213.76	−338.85	0.45
	0.426	0.846	0.609
Physicians per 1,000	−75.92	5.89	−0.02
	0.004	0.719	0.006
Population (millions)	−16.28	35.78	−0.02
	0.283	<0.005	0.001
Constant	4,548.84	3,529.95	1.27
	<0.005	<0.005	<0.005

Three regression models across the 306 HRRs. P-scores are presented below point estimates. HRRs are weighted by population. Both insurance and hospital Herfindahl indices are presented on a scale from 0 to 1, with 1 representing perfect monopoly and 0 perfect competition.

1,000 are small in magnitude and not statistically significant. Physician supply is positively associated with utilization but negatively correlated with prices and, because the price effect dominates, negatively correlated with spending. Population size is positively correlated with utilization but negatively correlated with prices.

Some other interesting associations emerge. First, markets with more HMO penetration have lower utilization ($p < .001$), which results in lower level of input price-adjusted spending ($p < .0001$), despite higher prices in these markets ($p < .001$). This finding could reflect spillovers, if areas with greater HMO penetration adopt more conservative practice styles or invest less in infrastructure or technology (Baker and Kenneth 1996; Baker 1997, 2001, 2003; Baker, Christopher, and Heidenreich 2004; Chernew et al. 2010). Alternatively, the findings could reflect unobserved SES or market traits or selection effects if, for example, HMOs enroll less healthy individuals than average (which is contrary with conventional wisdom). Markets with a greater

Table 4: Relationship between Insurer Competition and Price for Individual Services

Model	*Coefficient*	*p-Value*	*Mean*	*% Change Going from two to three Equal Size Insurers*
Aggregate	−0.30	<.005	0.9725	−5.1
Spinal fusion	−24,435.4	<.005	47,650	−8.5
Joint replacement	−8,653	.001	25,510	−5.7
Vaginal delivery	276.8	.56	6,788	0.7
Office visits	−26.4	<.005	62.78	−7.0
ED visits	−79.1	.015	237.8	−5.5
Surgical pathology	−10.7	.68	179.2	−1.0
Brain MRI	−168.1	.35	1,101	−2.5

Regression models are conducted at the HRR level (n = 306). All models also include % of population in HMOs, % of population in Medicare, % of population in Medicaid, % of population uninsured, hospital competition, hospital beds per 1,000, physicians per 1,000, and population. All models are adjusted for input prices.

share of uninsured also have lower input price adjusted spending (p = .033). This could also reflect spillovers or selection effects.

Robustness Checks

We tested how well our aggregate measures of utilization and prices were correlated with other measures of the price of quantity. Aggregate utilization is positively correlated with other measures of use, including office visits (ρ = .39), inpatient admissions (ρ = .51), and imaging procedures (ρ = .80). In addition, our price measure is correlated (ρ = .75) with Laspeyre's price index based on the top 100 CPTs and top 100 DRGs, indicating that results are not particularly sensitive to the method of measuring price and use. Our results regarding the impact of insurer concentration are not sensitive to the exclusion of health status scores or to the inclusion of the benefit generosity measures described above.

Cross-Sectional versus Longitudinal Identification

Like much of the geographic variation research, our analysis is cross-sectional and identifies associations as opposed to necessarily causal relationships (Kane, Lin, and Blewett 2002; Fisher et al. 2003a,b; Curtis et al. 2006; Baker, Fisher, and Wennberg 2008; Baker, Bundorf, and Kessler 2010). We opt for this approach because of concerns that changes in HHI may reflect more

noise than signal. Specifically, Dafny et al. (2011) examined three sources of data on insurer HHI (NAIC, AMA, and Goldman Saks; our data are most similar to AMA because they are based on HealthLeaders data) (Dafny et al. 2011). They find reasonable correlation in cross-section (between .7 and .8), but they find the changes are very noisy. Specifically, they write: "relying on year on year changes in the Herfindahl, as reported by the AMA or NAIC, are unlikely to yield consistent (let alone convincing) results." They further document numerous instances of noise in the changes. In fact, often the changes in HHI measures do not seem to pick up the effects of mergers. When we conduct longitudinal analysis, we in fact find different results that we consider at odds with much theory and supporting evidence from the only related study that examines physician income (Dafny et al. 2011). We should note that Dafny et al. (2011) also report considerable noise in the level of HHI (an implication of noise in the changes), but we believe the correlations between HHI measures created using different data sources are high enough to suggest cross-sectional measure and can provide a useful, albeit noisy signal. The bias from measurement error would suggest that our price effects are biased toward zero. Given the data noise and instability of findings from longitudinal work, caution in interpreting the exact magnitudes is warranted. Nevertheless, our results highlight the relationship between price and quantity and speak toward potential regulation of provider prices when insurer markets are fragmented.

Conclusion

Like Medicare spending, commercial spending exhibits considerable geographic variation. Much of the variation in the commercial sector reflects variation in prices (above input prices). Consistent with research that has focused on hospitals, we find more insurer concentration is associated with lower prices (Moriya, Vogt, and Gaynor 2010; Melnick, Shen, and Wu 2011) and higher utilization (Bates and Santerre 2008). This finding is consistent with the view that insurer market power offsets provider market power as opposed to generating a monopsonistic outcome. Among the seven services we evaluated individually, we found that the two most common outpatient services (office visits and emergency department visits) as well as the two most common surgical procedures (total joint replacement and spinal fusion) demonstrate the same relationship between price and insurance competition as the aggregate measure. However, for the remaining three services we find smaller and insignificant associations. This indicates that there is some heterogeneity in the

magnitude of effect of insurance competition and prices at the individual service level.

This research, while novel in its exploration of insurer market structure and medical spending, price, and utilization, has several limitations. For instance, MarketScan, while covering almost 40 million lives, focuses on large firms and may not be representative of other types of commercial insurance. More important, our cross-sectional design, although consistent with much of the geographic variation literature, is ill suited to make strong claims about causality of market structure on price, utilization, or spending. We also do not measure premiums or administrative fees that may be driven down by insurer competition. Even if medical spending falls in more concentrated insurance markets, insurers may not pass the savings on to consumers (Moriya, Vogt, and Gaynor 2010; Dafny, Duggan, and Ramanarayanan 2012). Thus, appropriate policy would encourage competition in both insurer and provider markets. In addition, this article does not address dimensions of care quality or health care workforce supply, both of which are likely impacted by the changes in prices and utilization that are associated with insurance competition.

Finally, our measure of provider market competition is imperfect. In contrast with some literature documenting a positive relationship between hospital concentration and prices (Robinson 2011; Gaynor and Town 2012), we find that standard measures of hospital competition are not related to input adjusted price (for all services) and observe no relationship between hospital market structure and input price-adjusted spending. Moreover, in analysis not shown, when we classify markets based on median hospital competitiveness, the effects of insurer competition are similar in the most versus the least competitive provider markets. However, our finding is consistent with that of Moriya, Vogt, and Gaynor (2010), who also use MarketScan data and find no relationship between hospital market structure and prices. This may reflect complex dynamics of health care markets in which reputations of some providers may enable them to charge high prices even in markets with many other providers (Office of Attorney General Martha Coakley 2011). Alternatively, our measure of hospital market structure may not be a good measure of overall competition because we lack good measures of physician market structure. This may be exacerbated by measurement error caused by the crosswalking procedure from counties to HRRs, as this error would likely bias results toward not finding a significant result. Population size, which may be a better proxy for competition overall (Dranove, Shanley, and Simon 1992), is associated with lower prices (and higher utilization) in our models.

Encouraging competition in both markets is difficult because of barriers to entry in the insurer market and reluctance of individuals to shop on the basis of price in the provider markets. Future research should look more closely at insurer and provider responses, as tightening fiscal circumstances will likely lead to substantial changes to both insurer and provider market structure. Nevertheless, the associations reported here suggest that fragmented insurers may not be able to negotiate as strongly with providers, and thus some of the gains from more competition in the insurance industry may be lost to a less competitive outcome in the provider market. Novel approaches to antitrust enforcement or even some form of price regulation may be needed to counteract these imperfections in competition.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.